Magnetic orientation and magnetic anisotropy in paramagnetic layered oxides containing rare-earth ions

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Shigeru Horii[1], Atsushi Ishihara[1], Takayuki Fukushima[1], Tetsuo Uchikoshi[2], Hiraku Ogino[1], Tohru S Suzuki[2], Yoshio Sakka[2], Jun-ichi Shimoyama[1] and Kohji Kishio[1]

[1] Department of Applied Chemistry, University of Tokyo, Hongo, Bunkyo-ku, Tokyo 113-8656, Japan

[2] Nano Ceramics Center, National Institute for Materials Science, Tsukuba, Ibaraki 277-8561, Japan

E-mail: tholy@mail.ecc.u-tokyo.ac.jp

Abstract. The magnetic anisotropies and easy axes of magnetization at room temperature were determined, and the effects of rare-earth (RE) ions were clarified for RE-based cuprates, RE-doped bismuth-based cuprates and RE-doped Bi-based cobaltite regarding the grain orientation by magnetic field. The easy axis, determined from the powder orientation in a static field of 10 T, depended qualitatively on the type of RE ion for all three systems. On the other hand, the magnetization measurement of the *c*-axis oriented powders, aligned in static or rotating fields, revealed that the type of RE ion strongly affected not only the directions of the easy axis but also the absolute value of magnetic anisotropy, and an appropriate choice of RE ion is required to minimize the magnetic field used for grain orientation. We also studied the possibility of triaxial grain orientation in high-critical-temperature superconductors by a modulated oval magnetic field. In particular, triaxial orientation was attempted in a high-oxygen-pressure phase of orthorhombic RE-based cuprates $Y_2Ba_4Cu_7O_y$. Although the experiment was performed in epoxy resin, which is not practical, in-plane alignment within 3° was achieved.

Keywords: rare-earth element, magnetic alignment, magnetic anisotropy, layered oxides

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